United States
Environmental Protection Agency

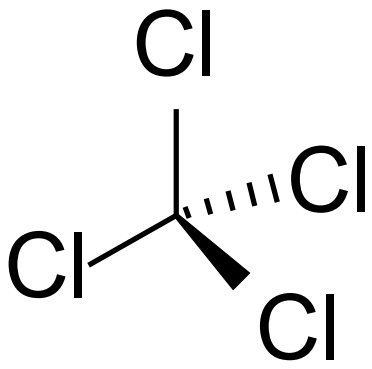
Office of Chemical Safety and
Pollution Prevention

Final Risk Evaluation for Carbon Tetrachloride

Systematic Review Supplemental File:

Data Quality Evaluation of Environmental Hazard Studies

CASRN: 56-23-5



October 2020

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HERO ID	Data Type	Reference	
7508	Acute (0-96 hour); Aquatic; Invertebrates	Leblanc, G. A.. 1980. Acute toxicity of priority pollutants to water flea (Daphnia magna). Bulletin of Environmental Contamination and Toxicology 24:684-691	**1**
18050	Chronic (>21 days); Aquatic; Fish	Barrows, M. E.,Petrocelli, S. R.,Macek, K. J.,Carroll, J. J.. 1980. Bioconcentration and elimination of selected water pollutants by bluegill sunfish (Lepomis macrochirus).	**4**
18064	Acute (0-96 hour); Aquatic; Fish	Buccafusco, R. J.,Ells, S. J.,Leblanc, G. A.. 1981. Acute toxicity of priority pollutants to bluegill (Lepomis macrochirus). Bulletin of Environmental Contamination and Toxicology 26:446-452	**7**
18670	Acute (0-96 hour); Aquatic; Fish	Dawson, G. W.,Jennings, A. L.,Drozdowski, D.,Rider, E.. 1977. The acute toxicity of 47 industrial chemicals to fresh and saltwater fishes. Journal of Hazardous Materials 1:303-318	**11**
93660	Acute (0-96 hour); Aquatic; other Amphibians	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133	**13**
93660	Chronic (>21 days); Aquatic; Fish	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133	**16**
492760	Acute (0-96 hour); Aquatic; Invertebrates	Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081	**19**
660810	Acute (0-96 hour); Aquatic; Fish	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259	**24**
660810	Acute (0-96 hour); Aquatic; other Photobacteriae	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259	**26**
660810	Acute (0-96 hour); Aquatic; Plants	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259	**28**
660810	Acute (0-96 hour); Aquatic; Invertebrates	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259	**30**
661061	Acute (0-96 hour); Aquatic; Plants	Brack, W.,Rottler, H.. 1994. Toxicity testing of highly volatile chemicals with green algae: A new assay. 1:223-228	**32**

661491	Acute (0-96 hour); Aquatic; Invertebrates	Martins, J.,Soares, M. L.,Saker, M. L.,Olivateles, L.,Vasconcelos, V. M.. 2007. Phototactic behavior in Daphnia magna Straus as an indicator of toxicants in the aquatic environment. Ecotoxicology and Environmental Safety 67:417-422	**36**
661492	Acute (0-96 hour); Aquatic; Invertebrates	Martins, J. C.,Saker, M. L.,Teles, L. F.,Vasconcelos, V. M.. 2007. Oxygen consumption by Daphnia magna Straus as a marker of chemical stress in the aquatic environment. Environmental Toxicology and Chemistry 26:1987-1991	**38**
676758	Acute (0-96 hour); Aquatic; Invertebrates	Yoshioka, Y.,Ose, Y.,Sato, T.. 1985. Testing for the toxicity of chemicals with Tetrahymena pyriformis. Science of the Total Environment 43:149-157	**40**
1617737	Other; Aquatic; Fish	Bauder, M. B.,Palace, V. P.,Hodson, P. V.. 2005. Is oxidative stress the mechanism of blue sac disease in retene-exposed trout larvae?. Environmental Toxicology and Chemistry 24:694-702	**43**
2366621	Acute (0-96 hour); Aquatic; Fish	Jia, R.,Cao, L. P.,Du, J. L.,Wang, J. H.,Liu, Y. J.,Jeney, G.,Xu, P.,Yin, G. J.. 2014. Effects of carbon tetrachloride on oxidative stress, inflammatory response and hepatocyte apoptosis in common carp (Cyprinus carpio). Aquatic Toxicology 152	**45**
2468140	Acute (0-96 hour); Aquatic; Fish	de Vera, M. P.,Pocsidio, G. N.. 1998. Potential protective effect of calcium carbonate as liming agent against copper toxicity in the African tilapia Oreochromis mossambicus. Science of the Total Environment 214:193-202	**47**
2468140	Other; Aquatic; Fish	de Vera, M. P.,Pocsidio, G. N.. 1998. Potential protective effect of calcium carbonate as liming agent against copper toxicity in the African tilapia Oreochromis mossambicus. Science of the Total Environment 214:193-202	**49**
2592033	Acute (0-96 hour); Aquatic; Invertebrates	Khangarot, B. S.,Das, S.. 2009. Acute toxicity of metals and reference toxicants to a freshwater ostracod, Cypris subglobosa Sowerby, 1840 and correlation to EC(50) values of other test models. Journal of Hazardous Materials 172:641-649	**51**
3481018	Acute (0-96 hour); Aquatic; Fish	Jia, R.,Cao, L.,Du, J.,Xu, P.,Jeney, G.,Yin, G.. 2013. The protective effect of silymarin on the carbon tetrachloride (CCl4)-induced liver injury in common carp (Cyprinus carpio). In Vitro Cellular and Developmental Biology 49:155-161	**53**
3481539	Acute (0-96 hour); Aquatic; Fish	Y. Liu, L. Cao, J. Du, R. Jia, J. Wang, P. Xu, G. Yin. 2015. Protective effects of Lycium barbarum polysaccharides against carbon tetrachloride-induced hepatotoxicity in precision-cut liver slices in vitro and in vivo in common carp (Cyprinus carpio L.). Comparative Biochemistry and Physiology - Part C: Toxicology and Pharmacology 169:65-72	**55**
3568343	Acute (0-96 hour); Aquatic; Fish	Chen, C. Y.,Wooster, G. A.,Bowser, P. R.. 2004. Comparative blood chemistry and histopathology of tilapia infected with Vibrio vulnificus or Streptococcus iniae or exposed to carbon tetrachloride, gentamicin, or copper sulfate. Aquaculture 239:421-443	**57**
3616521	Acute (0-96 hour); Aquatic; other Amphibians	Birge, W. J.,Black, J. A.,Kuehne, R. A.. 1980. Effects of Organic Compounds on Amphibian Reproduction.	**59**

3617749	Other; Aquatic; Invertebrates	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21	**61**
3617749	Acute (0-96 hour); Aquatic; Invertebrates	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21	**65**
3617749	Acute (0-96 hour); Aquatic; Fish	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21	**68**
3617867	Acute (0-96 hour); Aquatic; Plants	Tsai, K. P.,Chen, C. Y.. 2007. An Algal Toxicity Database of Organic Toxicants Derived by a Closed-System Technique. Environmental Toxicology and Chemistry 26:1931-1939	**71**
3625489	Other; Aquatic; Fish	Schell, J. D. J.. 1987. Interactions of Halogenated Hydrocarbon Mixtures in the Embryo of the Japanese Medaka (Oryzias latipes).	**74**
3634436	Acute (0-96 hour); Aquatic; Fish	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.	**76**
3634436	Acute (0-96 hour); Aquatic; Invertebrates	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.	**79**
3660853	Acute (0-96 hour); Aquatic; Fish	Geiger, D. L.,Brooke, L. T.,Call, D. J.. 1990. Acute toxicities of organic chemicals to fathead minnows (Pimephales promelas): Volume V.	**82**
3662132	Acute (0-96 hour); Aquatic; Fish	Weber, L. J.,Gingerich, W. H.,Pfeifer, K. F.. 1979. Alterations in Rainbow Trout Liver Function and Body Fluids Following Treatment with Carbon Tetrachloride or Monochlorobenzene. 99:401-413	**84**
3673049	Acute (0-96 hour); Aquatic; Invertebrates	Richie, J. P., Jr.,Mills, B. J.,Lang, C. A.. 1984. The Verification of a Mammalian Toxicant Classification Using a Mosquito Screening Method. 4:1029-1035	**86**
3684136	Acute (0-96 hour); Aquatic; Fish	Koskinen, H.,Pehkonen, P.,Vehniainen, E.,Krasnov, A.,Rexroad, C.,Afanasyev, S.,Molsa, H.,Oikari, A.. 2004. Response of Rainbow Trout Transcriptome to Model Chemical Contaminants. 320:745-753	**88**
3684293	Acute (0-96 hour); Aquatic; Fish	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.	**90**
3684293	Chronic (>21 days); Aquatic; Fish	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.	**92**
4338225	Chronic (>21 days); Aquatic; Fish	Kotsanis, N.,Metcalfe, C. D.. 1988. Accelerating an in vivo trout carcinogenesis assay with carbon tetrachloride and partial hepatectomy. 15th Annual Aquatic Toxicity Workshop	**94**

Study Citation:	Leblanc, G. A.. 1980. Acute toxicity of priority pollutants to water flea (Daphnia magna). Bulletin of Environmental Contamination and Toxicology 24:684-691
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	7508

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Obtained from commercial supplier, but details were omitted.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Study reports a minimum purity of 80 percent
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	While CCl4 is volatile and the not measured, the researchers did attempt to have a closed system.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	5-8 test concentrations were reported to be used for each chemical, but the actual values were not available.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Study didn't report whether test organisms were acclimatized.

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Hero ID:	7508

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	It appears there were 15 daphnia in each test concentration for CCl4 and no replicates to avoid losing CCl4 to volatilization. OECD TG 202recommends at least 20 total daphnids and separated into 4 different test vessels.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Medium	× 2	4	Data for most but not all outcomes by study group were reported but these minor uncertainties or limitations are unlikely to have a substantial impact on results.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.3	
Extracted			Yes			

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Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	7508

Domain	Metric	Rating†	MWF⋆	Score	Comments††

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Barrows, M. E.,Petrocelli, S. R.,Macek, K. J.,Carroll, J. J.. 1980. Bioconcentration and elimination of selected water pollutants by bluegill sunfish (Lepomis macrochirus).
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	18050

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	No purity of test chemical was reported, but liquid gas chromatography was performed during the experiment and purity of the chemical could be determined then, although it wasn't reported in the paper.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Method for allocation was not reported.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						

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Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	18050

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Minor reservations about the source of fish. Three populations of bluegill sunfish (Lepomis macrochirus) were obtained from a commercial fish farmer in Connecticut, one population obtained from a commercial fish farmer in Nebraska. Age not reported, but length and weight was documented, and age may not be a big factor in determining BCF.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Study started with 100 organisms per exposure group, and took out 5 fish on each sampling day. OECD recommends having enough to remove at least 4. Number of replicates not reported.
	Metric 16:	Adequacy of Test Conditions	Low	× 1	3	Recommended water temperature for bluegill is 20-25 degrees C and this study was conducted at 16 degrees C which could have lowered metabolism in fish.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	Low	× 2	6	BCFs and half-lives were reported, but assessment was not as sensitive as it should be for calculating a BCF. OECD recommends noting if both sexes are used, and ensuring that differences in growth and lipid content between sexes is not significant before the start of the exposure, in particular if it is anticipated that pooling of male and female fish will be necessary to ensure detectable substance concentrations and/or lipid content. This was not noted.
	Metric 18:	Consistency of Outcome Assessment	Medium	× 1	2	Incomplete reporting of minor details of outcome assessment protocol execution
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	Low	× 2	6	OECD recommends noting if both sexes are used, and ensuring that differences in growth and lipid content between sexes is not significant before the start of the exposure, in particular if it is anticipated that pooling of male and female fish will be necessary to ensure detectable substance concentrations and/or lipid content. This was not noted.

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Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	18050

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Data on attrition and health outcomes unrelated to exposure were not reported for each study group.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Medium	× 2	4	Not all regressions, lipid content, and weights were reported, but BCFs and half-lives were reported for all chemicals.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			~~Medium~~ ⟶ High		1.7	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Buccafusco, R. J.,Ells, S. J.,Leblanc, G. A.. 1981. Acute toxicity of priority pollutants to bluegill (Lepomis macrochirus). Bulletin of Environmental Contamination and Toxicology 26:446-452
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	18064

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Study says all chemicals tested were purchased from commercial chemical suppliers, but does not specify where CCl4 came from. Study does state "were procured from those commercial sources able to provide the purest grade available. All chemicals tested were greater than or equal to 80 percent pure..."
	Metric 3:	Test Substance Purity	Medium	× 1	2	Study reports a minimum purity of 80 percent for all chemicals tested, but does not specify what the purity is for CCl4.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	Low	× 1	3	Many chemicals tested and no details provided about negative control response, although it says control mortality was recorded.
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Volatile chemicals were capped, but paper does not specify headspace in the capped jars. The jars capped could have had low DO content, but DO was measured at 0 and at 96 hours..
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Nominal concentrations were used and were not measured. CCl4 is volatile, but test jars were capped immediately following addition of test chemical. Precipitate was observed in test jars indicating test concentrations may have been above water solubility
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	

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Data Type: Acute (0-96 hour); Aquatic; Fish
Hero ID: 18064

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Study says that the test was conducted according to EPA's "Methods for acute toxicity tests with fish, macroinvertebrates, and amphibians" which says for static tests you must have 10 organisms in each treatment divided into at least two test chambers; not sure how they got the exposure concentrations used of what the exposure concentrations were.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	Test substance concentration was not reported. Paper states " The acute toxicity of most of the chemicals tested was at concentrations above their water solubility and therefore, the test material or one or more of its constituents precipitated ..." Precipitate was observed for CCl4
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Test animals utilized were young of the year bluegill (L. macrochirus) obtained from commercial fish suppliers within the continental United States. Ag e and weight reported, sex not reported
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	× 1	2	Acclimation period not stated, but does state tests followed "Methods for acute toxicity tests with fish, macroinvertebrates and amphibians" which specifies a 14 day acclimation period for fish. Study does report a 48 hour time prior to test where fish were not fed and observed; fish were not used if had >3 percent mortality,
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Number of fish per test jar reported, but number of replicates not reported
	Metric 16:	Adequacy of Test Conditions	Low	× 1	3	Minor uncertainties around housing conditions (headspace in jar) DO concs for all chemicals ranged from 9.7 mg/L at start of test to 0.3 mg/L at 96 hours. Low DO can impact survival; DO at end of test for CCL4 not reported.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	

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Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	18064

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	Low	× 2	6	Study did not provide enough information to allow a comparison of environmental conditions
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	Do not provide information about health outcomes of each study group
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	Not clear what method was used to calculate LC50 for CCl4: "The LC50s and 95 percent confidence intervals were calculated, where possible, by the moving average angle method (HARRIS 1959). The nominal test concentrations were transformed to logarithms and corresponding percentage mortalities to angles. Each group of these successive angles was then averaged and the LCSO was estimated by linear interpolation. between the successive concentrations whole average angles bracketed 45". When the test data did not meet Harris' method requirements, the LC50s were calculated by the log probit method, a modification of the LITCHFIELD + WILCOXON (1949) method."
	Metric 22:	Reporting of Data	Low	× 2	6	The data for the static test were not presented in full, and no information was reported for controls.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			Medium		2.0	
Extracted			Yes			

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Domain	Metric	Rating†	MWF⋆	Score	Comments††

⋆ MWF = Metric Weighting Factor

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where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

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Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	18670

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	Low	× 2	6	Analytical confirmation of CCl4 was not reported.
	Metric 2:	Test Substance Source	Low	× 1	3	CCl4 was either research or chemically pure grade quality from commercial sources.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity was not reported.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Did not report whether or not CCl4 was measured.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	The number of organisms/replicates was not reported.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	Minor uncertainties and will not have substantial impact on the results.

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Study Citation:	Dawson, G. W.,Jennings, A. L.,Drozdowski, D.,Rider, E.. 1977. The acute toxicity of 47 industrial chemicals to fresh and saltwater fishes. Journal of Hazardous Materials 1:303-318
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	18670

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Low	× 2	6	Data for exposure-related findings were not shown for each study group.
	Metric 23:	Explanation of Unexpected Outcomes	Low	× 1	3	The study did not report any measures of variability and/or insufficient information was provided.
Overall Quality Determination‡			Medium		1.7	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type:	Acute (0-96 hour); Aquatic; other Amphibians
Hero ID:	93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	The test substance was identified as carbon tetrachloride.
	Metric 2:	Test Substance Source	Low	× 1	3	The toxicant source was not identified in the publication.
	Metric 3:	Test Substance Purity	High	× 1	1	All test substances used in the toxicity tests were reagent grade quality.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	Amphibian controls were used in the study.
	Metric 5:	Negative Control Response	High	× 1	1	The control survival ranged from 84-99 percent.
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no mention of randomized allocation of test organisms.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	Flow-through testing with a closed vessel was devoid of air space to minimize volatilization.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	The researchers administrated the test solutions (exposure scenario) consistently across the toxicity test.
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	Gas-liquid chromatography was used to measure test concentrations daily.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	Amphibian embryo-larvae were exposed up to 4 days post-hatch, sufficient to determine effects in embryos and larvae.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	There were 6 exposure concentrations with appropriate spacing used fore each amphibian tested.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	All exposure concentrations were below the water solubility of carbon tetrachloride.
Domain 4: Test Organism						

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Study Citation: Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type: Acute (0-96 hour); Aquatic; other Amphibians
Hero ID: 93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	High	× 2	2	Amphibians used were appropriate for this study, with the exception of the African Clawed frog, which is not endemic to the U.S.
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	× 1	2	Controls and exposed organisms were appeared to be treated identical with the exception of CCl4 in the controls. After re-reading, I did not see any acclimatization and pretreatment conditions reported, but if there were adverse effects from this, it would have shown up in the controls and it did not.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	Single replicates of 50 to 125 eggs were used per test concentration.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	A loading rate of up to 125 eggs per test concentration was used, which did not appear to impact test results. Environmental conditions were within acceptable ranges, and control mortality was acceptable.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	Test vessels observed daily to assess development and remove dead test organisms.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	LC50, LC10, LC1s were assessed adjusted for control mortality, but detailed control mortality data were not provided.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	Environmental conditions appeared consistent across test concentrations and control mortality ranged from 1 - 16 percent.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Teratogenesis was reportedly infrequently in the controls (percent teratogenicity not reported) and control mortality ranged from 1 to 16 percent, which is acceptable.
Domain 7: Data Presentation and Analysis						

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Study Citation:	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type:	Acute (0-96 hour); Aquatic; other Amphibians
Hero ID:	93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 21:	Statistical Methods	Medium	× 1	2	Survival data was reported as percent of total organisms at each exposure concentration after corrected for control mortality, but detailed control data were not reported. LC50s, LC10s, and LC1s were calculated using log-probit analysis.
	Metric 22:	Reporting of Data	Medium	× 2	4	Most, but not all, data endpoints were reported. You could not re-create the statistics in the paper.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	Unexpected outcomes were not reported in the study.
Overall Quality Determination‡			High		1.3	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	The test substance was identified as carbon tetrachloride.
	Metric 2:	Test Substance Source	Low	× 1	3	The toxicant source was not identified in the publication.
	Metric 3:	Test Substance Purity	High	× 1	1	All test substances used in the toxicity tests were reagent grade quality.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	Fish control eggs were used in the study.
	Metric 5:	Negative Control Response	High	× 1	1	The control survival ranged from 84-99 percent.
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no mention of randomized allocation of test organisms.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	Flow-through testing with closed vessel devoid of air space was used to minimize volatilization.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	The researchers administrated the test solutions (exposure scenario) consistently across the toxicity test.
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	Gas-liquid chromatography was used to measure test concentrations daily.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	Fish embryo-larvae were exposed up to 4 days post-hatch , sufficient to determine effects in embryos and larvae.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	There were 6 exposure concentrations with appropriate spacing used for each fish tested.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	All exposure concentrations were below the water solubility of carbon tetrachloride.
Domain 4: Test Organism						

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Study Citation:	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	High	× 2	2	Rainbow trout and fathead minnow are well known species. The trout were obtained from a hatchery and freshly fertilized fathead minnow eggs were obtained from the EPA Newtown Fish Toxicology Laboratory.
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	× 1	2	Controls and exposed organisms were appeared to be treated identical with the exception of CCl4 in the controls. I did not see any acclimatization and pretreatment conditions reported, but if there were adverse effects from this, it would have shown up in the controls and it did not.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	Single replicates of 50 to 125 eggs were used per test concentration.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	A loading rate of up to 125 eggs per test concentration was used, which did not appear to impact test results. Environmental conditions were within acceptable ranges, and control mortality was acceptable.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	Test vessels observed daily to assess development and remove dead test organisms.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	LC50, LC10, LC1s were assessed adjusted for control mortality, but detailed control mortality data were not provided.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	Environmental conditions appeared consistent across test concentrations and control mortality ranged from 1 - 16 percent.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Teratogenesis was reportedly infrequent in controls (percent teratogenicity not reported) and control mortality ranged from 1 to 16 percent, which is acceptable.
Domain 7: Data Presentation and Analysis						

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Study Citation:	Black, J. A.,Birge, W. J.,McDonnell, W. E.,Westerman, A. G.,Ramey, B. A.,Bruser, D. M.. 1982. The aquatic toxicity of organic compounds to embryo-larval stages of fish and amphibians. 133
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	93660

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 21:	Statistical Methods	High	× 1	1	Survival data was reported as percent of total organisms at each exposure concentration after corrected for control mortality, but detailed control data were not reported. LC50s, LC10s, and LC1s were calculated using log-probit analysis.
	Metric 22:	Reporting of Data	Medium	× 2	4	Most, but not all, data endpoints were reported. You could not re-create the statistics in the paper.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	Unexpected outcomes were not reported in the study.
Overall Quality Determination‡			High		1.3	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	492760

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	According to the authors, acetone was used as a solvent for CCl4. Specific concentrations were identified. Test substance was clearly identified.
	Metric 2:	Test Substance Source	High	× 1	1	In the article, Section 2.5 describes the chemical(s) used in this study. Chemical(s) were purchased at a verified manufacturer.
	Metric 3:	Test Substance Purity	Low	× 1	3	For the article no data was reported relevant to Metric 3.
Domain 2: Test Design						
	Metric 4:	Negative Controls	Low	× 2	6	In the article, section 2.2 authors state that acetone will be used as a solvent for CCl4. However there is no mention/discussion if zero concentration of CCl4 includes acetone or not. Figure 4 B shows concentration of CCl4 from 0 to 2 mg/l. If acetone was used when CCl4 concentration were zero then a proper assessment of exposure is not necessarily being accomplished, because acetone could be toxic. And if acetone was not used when CCl4 concentration were zero, then a proper control is not being implemented.
	Metric 5:	Negative Control Response	Low	× 1	3	In the article, from Figure 4 B when concentration of CCl4 is zero, there is expression of HSP70/HSC70 and Hb thus a biological response is recorded for the negative control. However there is no mention/ discussion if zero concentration of CCl4 includes acetone or not. Figure 4 B shows concentration of CCl4 from 0 to 2 mg/l. If acetone was used when CCl4 concentration were zero then a proper assessment of exposure is not necessarily being accomplished, because acetone could be toxic. And if acetone was not used when CCl4 concentration were zero, then a proper control is not being implemented.

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Study Citation: Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081
Data Type: Acute (0-96 hour); Aquatic; Invertebrates
Hero ID: 492760

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 6:	Randomized Allocation	Low	× 1	3	For the article no allocation data was presented .
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	In the article, the authors explained experimental system well, however they could have shared data from the acute toxicity study which they used to determined the concentration of chemical to use in the actual toxicity study. In Section 2.2 the authors explains further about the latter. The use of acetone as a solvent for CCl4 seems reasonable because CCl4 is not soluble in water.
	Metric 8:	Consistency of Exposure Administration	Medium	× 1	2	The authors did an acute toxicity study which data was not shared to the reader. The data was used to determine the concentration of the chemicals to implement in actual experiment.
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	For the article no data was reported relevant to Metric 9.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	In the article, the authors explain the duration of exposure were determined from an acute toxicity study. In the acute study after 24 hrs of exposure three concentrations corresponding to 1/1000, 1/100, and 1/10 of the 24 hr LC50 were selected from each compound. In section 2.2 the authors explain further.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	The authors did explain the number of exposure groups and exposure levels. Authors justified the latter through an acute toxicity study. Even though the metric was met, a low confidence level criteria seems appropriate because the data for the acute study is not shown.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	In the article it is not clear if the concentration of the solvent used or if the chemical exposure concentration exceeded the water solubility.
Domain 4: Test Organism						

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Study Citation: Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081

Data Type: Acute (0-96 hour); Aquatic; Invertebrates

Hero ID: 492760

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	High	× 2	2	The authors describe the test organisms as a strain of C. tentans. Test organisms were obtained as larvae from adults reared in the lab. Section 2.1 of the article explains further.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	In section 2.1 of the article, the authors state that test organisms were reared in the lab.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	In section 2.2 the authors state that 10 test organisms were used for each chemical exposure. Authors did not discuss replicates nor was any data shown to suggest replicates were carried out.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	In section 2.1 the authors outline the conditions the test conditions.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	Low	× 2	6	The reported outcome assessment methods was to observe the band intensity of gene expression of HSP70, HSC70, Hb A, and Hb B at varying chemical exposure. The degree of sensitivity for HSC70 is questionable because in the discussion the authors state that HSC70 are expressed regardless of external external factors. In section 4 of the article the authors state, "HSC70 is known to be constitutively expressed and not inducible by environmental stressors".
	Metric 18:	Consistency of Outcome Assessment	Medium	× 1	2	The consistency of outcome assessment (gene expression) was uniform, but the actual concentration of chemical exposed varied chemical to chemical. The concentration of the chemicals were determined from an acute toxicity study, which the data was not shown. The latter seem to be minor details which are unlikely to have substantial impact on results.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	In section 2.1 and 2.2 of the article, the authors discuss environmental conditions or other factors that could influence the outcome assessment. The conditions were kept consistent and standard.

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Study Citation: Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081
Data Type: Acute (0-96 hour); Aquatic; Invertebrates
Hero ID: 492760

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	For the article no data was reported relevant to Metric 20. The authors did not mention any outcomes unrelated to exposure.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Low	× 1	3	The authors presented the data poorly (poor resolution on y-axis) and no statistical analysis was carried out.
	Metric 22:	Reporting of Data	Low	× 2	6	In the article, the data for all outcomes were reported and data was reported for each exposure concentration and control group. However there is not enough data to extrapolate valuable endpoints. From the graph figures 1b, 2b, 3b, and 4b the reader can conclude a general trend and estimate band intensity of gene expression. The data shown in figure 5 of fresh and dry body weights has the following issues: does the data reflect 10 organisms used collectively or individually, measurement was to 0.1 mg which is not sensitive enough for weighing individual organisms, or if the authors weighed all 10 organisms together then there is no statistical analysis shown or can be extrapolated by the reader.
	Metric 23:	Explanation of Unexpected Outcomes	Low	× 1	3	In the article, the authors cite that unexpected outcome was the decrease in HSC70 expression as concentrations of CCl4 increased. In section 4 of the article the authors state, "HSC70 is known to be constitutively expressed and not inducible by environmental stressors". Among the other chemicals only CCl4 and FT induced a decreased in the expression of HSP70/HSC70. The outcome of Hb A/B expression was not discussed specific to CCl4 but generalized in the following statement, "chemical induced Hb gene expression could be due to increase in oxygen demand for xenobiotic metabolic process". The authors do not discuss the results from the body fresh weight and body dry weight (data shown in figure 5), probably because there is no trend that can be observed for CCl4 and a few other chemicals.

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Study Citation:	Lee, S. M.,Lee, S. B.,Park, C. H.,Choi, J.. 2006. Expression of heat shock protein and hemoglobin genes in Chironomus tentans (Diptera, chironomidae) larvae exposed to various environmental pollutants: A potential biomarker of freshwater monitoring. Chemosphere 65:1074-1081
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	492760

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Overall Quality Determination‡		~~Medium~~ ⟶ Low		2.2	I would downgrade the following paper because there is little to no valuable information related to ecological hazard discipline that can be obtained from the paper. The results of the acute toxicity study could have been relevant to the discipline however authors did not show data. The data shown for gene expression is limited because of poor graphs and lack of statistical calculations.
Extracted		No			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/Information not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	Concentrations were measured using gas chromatography, but concentrations were not reported in the paper
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	Number of exposure groups and spacing of exposure levels not reported, though followed OECD guideline 203
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Solvent concentrations were not discussed; used closed containers to minimize volatility
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Source of fish not reported
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	660810

Domain		Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	No details on statistical methods were reported. Just reported 48-hr LC50 as mortality (percent) vs concentration
	Metric 22:	Reporting of Data	Medium	× 2	4	Reported 48 hr LC50, but no additional details included
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; other Photobacteriae
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/Information not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	Low	× 2	6	Used Microtox test, which includes negative controls, but controls were not described
	Metric 5:	Negative Control Response	Low	× 1	3	Negative control response not described
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Experimental system and test media were described, but not in great detail. Cite "Microtox test" and German standard DIN 38412 L 34.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	Concentrations were measured using gas chromatography, but concentrations were not reported in the paper
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	Number of exposure groups and spacing of exposure levels not reported, though EC50 was reported
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Solvent concentrations were not discussed
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Source of organisms not reported
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Replicates were not discussed
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; other Photobacteriae
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	No details on statistical methods were reported
	Metric 22:	Reporting of Data	Medium	× 2	4	Reported EC50, but no additional details included
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			Medium		1.8	
Extracted			Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/Information not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	Concentrations were measured using gas chromatography, but concentrations were not reported in the paper
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	Number of exposure groups and spacing of exposure levels not reported, though followed modified OECD guideline 201
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Solvent concentrations were not discussed; used modified test containers to minimize volatility without causing growth inhabitation or death merely due to closed containers
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Source of algae not reported
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	

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Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	No details on statistical methods were reported. Just reported EC50/72 hours as percentage of growth inhibition versus concentration
	Metric 22:	Reporting of Data	Medium	× 2	4	Reported EC50/72hrs, but no additional details included
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/Information not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Specific methodology not reported in paper, cites OECD guidelines
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	Concentrations were measured using gas chromatography, but concentrations were not reported in the paper
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Number of exposure groups and exposure levels not reported, though EC50 was reported
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Source of organisms not reported
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Freitag, D.,Ballhorn, L.,Behechti, A.,Fischer, K.,Thumm, W.. 1994. Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28:253-259
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	660810

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation: Brack, W.,Rottler, H.. 1994. Toxicity testing of highly volatile chemicals with green algae: A new assay. 1:223-228
Data Type: Acute (0-96 hour); Aquatic; Plants
Hero ID: 661061

Domain		Metric	Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	Test substance was identified by name.
	Metric 2:	Test Substance Source	High	× 1	1	Authors identified Merck as the source of the test substance.
	Metric 3:	Test Substance Purity	Low	× 1	3	"p.a." is reported for CCl4, which is analytical grade quality.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	"Each test series contained three controls without toxicant and two controls with 0.8 mg/L Cu2+ (CuS04). This concentration reduces algal growth to50 percent and is used to check normal sensitivity of the organisms."
	Metric 5:	Negative Control Response	Low	× 1	3	The biological responses of the negative control groups were not reported
	Metric 6:	Randomized Allocation	Low	× 1	3	It was not reported whether there was random placement of flasks.
Domain 3: Exposure Characterization						

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Study Citation: Brack, W.,Rottler, H.. 1994. Toxicity testing of highly volatile chemicals with green algae: A new assay. 1:223-228
Data Type: Acute (0-96 hour); Aquatic; Plants
Hero ID: 661061

Domain		Metric	Rating†	MWF*	Score	Comments††
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	The purpose of the test was to determine a way of doing algae tests with volatile chemicals, as the OECD guidelines recommends using a permeable stopper in the flask to allow CO2 to pass through so as not to impede algae growth. However with volatile chemicals this is not possible because of loss of test substance through vitalization. Therefore in test, they used a closed system that still provided a source of CO2 for the algae. Authors reported, "Deviations between the duplicates, extracted from the same test culture were less than 5 percent . To estimate recovery of this analytical method, 20 mL headspace vials were filled completely with water or alga suspension. The vials were sealed gas"tight with septa. Gravimetrically defined amounts of the volatile chlorinated hydrocarbons were injected via syringe through the Septa into the liquids and dissolved. From these solutions samples were taken and extracted as explained above. Recovery of the method amounted to 90 " S percent and was independent from cell density."
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	Exposures were administered consistently across study groups.
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	Analytical measurments by gas chromatography/ electron capture detector (GC/ECD) following liquid-liquid microextraction were taken at test initiation and end.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	The test was 72 hours in duration, which is recommended by OECD Guideline 201.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	Test concentrations are reported in figure 3 and show a dose response for growth inhibition. The figure shows at least 5 concentrations tested which is recommended by OECD Guideline 201.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	The test conc for CCl4 shown in figure 3 (highest conc is <10 mg/l) are well below CCl4's solubility level of 793 mg/l.
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	This is not a commonly used algal species. Not a TG species.

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Study Citation: Brack, W.,Rottler, H.. 1994. Toxicity testing of highly volatile chemicals with green algae: A new assay. 1:223-228
Data Type: Acute (0-96 hour); Aquatic; Plants
Hero ID: 661061

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	Pretreatment conditions included, "Precultures and test cultures were grown in the medium for unicellular algae according to KUflL (1962) (Table 2). Incubation of all cultures was done in a Orbital Incubator (Gallenkamp). The cultures were shaken permanently with a frequency of 120 rpm. They wereilluminated from above with 130 "E/m2s without light dark cycle. The photosynthetically effective light was determined with a Quantum Sensor from Licor Inc. The temperature was maintained at 20 " l deg C."
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Two replicates per test concentration (8 concentrations). Three replicates are preferred.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	Glass flasks which are recommended in OECD 201. Temp and pH were within recommended ranges.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	Biomass assessed using fluorometric measurement of total chlorophyll for controls and treatment groups to determined EC10s and EC50s.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	No inconsistencies were reported, and both positive and negative controls performed as expected.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	There were no reported differences among study groups in environmental conditions or other factors that would influence the outcome assessment.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	Positive and negative controls performed as expected and no outcomes unrelated to exposures were reported.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	Probit analysis was used to assess significant differences in biomass.
	Metric 22:	Reporting of Data	Medium	× 2	4	Figure 3 shows the results of the tests at each conc for each chemical but it's difficult to determine the exact concentrations from the figure, so some minor uncertainties remain.

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Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	661061

Domain	Metric	Rating†	MWF⋆	Score	Comments††
	Metric 23: Explanation of Unexpected Outcomes	Medium	× 1	2	SDs were provided, but it was unclear whether or not there were any unexpected outcomes.
Overall Quality Determination‡		High		1.4	
Extracted		Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Martins, J.,Soares, M. L.,Saker, M. L.,Olivateles, L.,Vasconcelos, V. M.. 2007. Phototactic behavior in Daphnia magna Straus as an indicator of toxicants in the aquatic environment. Ecotoxicology and Environmental Safety 67:417-422
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	661491

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Did not report randomization.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	It is not clear, but it appears that nominal concentrations were used in the study.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	661491

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.1	
Extracted			Yes			

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† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Martins, J. C.,Saker, M. L.,Teles, L. F.,Vasconcelos, V. M.. 2007. Oxygen consumption by Daphnia magna Straus as a marker of chemical stress in the aquatic environment. Environmental Toxicology and Chemistry 26:1987-1991
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	661492

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Randomization was not reported.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	It is unclear if the test concentration was measured.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	N/A		N/A	Only one concentration was reported and is acceptable for this type of test.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	× 1	2	It was not clear, but was described in another paper on CCl4 from the same laboratory/test group.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	661492

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.2	
Extracted			Yes			

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† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1985. Testing for the toxicity of chemicals with Tetrahymena pyriformis. Science of the Total Environment 43:149-157
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	676758

Domain		Metric	Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source of test chemicals not reported
	Metric 3:	Test Substance Purity	Medium	× 1	2	Purity not reported; study states "all other reagents were of analytical grade"
Domain 2: Test Design						
	Metric 4:	Negative Controls	Low	× 2	6	The study states "The relative growth rate was calculated as the ratio of the number of cells cultured with a chemical against the number cultivated in a blank", which implies the blank is a control but this is not stated. Very little information is presented about what is in the blank.
	Metric 5:	Negative Control Response	N/A		N/A	This is an acute study with lots of chemicals reported, and they did not report on the control response for each chemical.
	Metric 6:	Randomized Allocation	Low	× 1	3	No mention of random allocation
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	The methods section does not state test chambers were closed for CCl4, but page 155 states "The authors adopted 24 h for the test time and the conditions of No. 4 for culturing. The EC50 values of 57 chemicals were determined by themethod and are shown in Table 1." Test condition 4 on Figure 2 indicates "cultured in vertical vessel with a silicone rubber stopper"The study also states "the air space of 20 ml in the test tube is sufficient to determine the EC50 value of a chemical for a short cultivation period; volatile chemicals can therefore be tested in the sealed vessel."

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Study Citation: Yoshioka, Y.,Ose, Y.,Sato, T.. 1985. Testing for the toxicity of chemicals with Tetrahymena pyriformis. Science of the Total Environment 43:149-157
Data Type: Acute (0-96 hour); Aquatic; Invertebrates
Hero ID: 676758

Domain	Metric		Rating†	MWF*	Score	Comments††
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	There were differences in how exposure was administered but because the point of the study was to figure out what housing conditions were best for this type of protozoa. These differences could have effected the EC50 reported. Authors report that some of the temperatures, and amount of food changed the growth rate of the protozoa.
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Study does not state whether exposure concentrations are nominal or measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Unacceptable	× 1	4	No information was provided on number of exposure groups or spacing of exposures for CCl4. Figure 2 shows five exposure concentrations used to determine the EC50 value for aniline.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Tetrahymena pyriformis was preserved in a sterile medium of 2 percent proteasepeptone at 20" C which was renewed at 2-4 week intervals. Unsure but it sounds like they cultured their own animals in the lab from descriptions of previous studies in this paper. Acknowledgements say "Pr. Nozawa of Gifu University for providing T. pyriformis in germ-free condition"
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	Number of test organisms and replicates were not reported for the test groups. Each test solution was inoculated with 0.2 ml of pre-cultures T. pyriformis, but pre-exposure numbers in that 0.2 ml were not counted. Number of replicates not stated.It was reported that 20 cells per slide were counted using one method of counting, but that was the only number provided.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outcome Assessment						

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Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1985. Testing for the toxicity of chemicals with Tetrahymena pyriformis. Science of the Total Environment 43:149-157
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	676758

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 17:	Outcome Assessment Methodology	Medium	× 2	4	They describe two different methods for counting the cells. Some uncertainty regarding the method selected to calculate the EC50 values, but the correlation coeffieicnt between the two methods was 0.998.
	Metric 18:	Consistency of Outcome Assessment	Medium	× 1	2	Assessment protocol was reported with minor uncertainties.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Low	× 2	6	Data for exposure related findings were not shown for each study group.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			Unacceptable		4	
Extracted			No			

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Bauder, M. B.,Palace, V. P.,Hodson, P. V.. 2005. Is oxidative stress the mechanism of blue sac disease in retene-exposed trout larvae?. Environmental Toxicology and Chemistry 24:694-702
Data Type:	Other; Aquatic; Fish
Hero ID:	1617737

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/information not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Acclimation not reported
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Bauder, M. B.,Palace, V. P.,Hodson, P. V.. 2005. Is oxidative stress the mechanism of blue sac disease in retene-exposed trout larvae?. Environmental Toxicology and Chemistry 24:694-702
Data Type:	Other; Aquatic; Fish
Hero ID:	1617737

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.5	
Extracted		Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Jia, R.,Cao, L. P.,Du, J. L.,Wang, J. H.,Liu, Y. J.,Jeney, G.,Xu, P.,Yin, G. J.. 2014. Effects of carbon tetrachloride on oxidative stress, inflammatory response and hepatocyte apoptosis in common carp (Cyprinus carpio). Aquatic Toxicology 152
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	2366621

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured; nominal
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	1 Concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Acclimation not reported
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	Number of organisms and replicates not reported
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Jia, R.,Cao, L. P.,Du, J. L.,Wang, J. H.,Liu, Y. J.,Jeney, G.,Xu, P.,Yin, G. J.. 2014. Effects of carbon tetrachloride on oxidative stress, inflammatory response and hepatocyte apoptosis in common carp (Cyprinus carpio). Aquatic Toxicology 152
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	2366621

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.5	
Extracted		Yes			

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‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	de Vera, M. P.,Pocsidio, G. N.. 1998. Potential protective effect of calcium carbonate as liming agent against copper toxicity in the African tilapia Oreochromis mossambicus. Science of the Total Environment 214:193-202
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	2468140

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	2468140

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.3	
Extracted		Yes			

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where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
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Data Type:	Other; Aquatic; Fish
Hero ID:	2468140

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Data Type:	Other; Aquatic; Fish
Hero ID:	2468140

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.3	
Extracted		Yes			

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where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Khangarot, B. S.,Das, S.. 2009. Acute toxicity of metals and reference toxicants to a freshwater ostracod, Cypris subglobosa Sowerby, 1840 and correlation to EC(50) values of other test models. Journal of Hazardous Materials 172:641-649
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	2592033

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Purchased from SRL (India) and E. Merck (India)
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Researchers did not report how organisms were allocated to study groups.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Only nominal concentrations were reported in the paper. EC50 values were based on nominal concentrations.
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Solvent was discussed for some chemicals, but not for CCl4.
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	

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Study Citation:	Khangarot, B. S.,Das, S.. 2009. Acute toxicity of metals and reference toxicants to a freshwater ostracod, Cypris subglobosa Sowerby, 1840 and correlation to EC(50) values of other test models. Journal of Hazardous Materials 172:641-649
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	2592033

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.3	
Extracted			Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Jia, R.,Cao, L.,Du, J.,Xu, P.,Jeney, G.,Yin, G.. 2013. The protective effect of silymarin on the carbon tetrachloride (CCl4)-induced liver injury in common carp (Cyprinus carpio). In Vitro Cellular and Developmental Biology 49:155-161
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3481018

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Commercial source not specified
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	nominal injection
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Only one concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Jia, R.,Cao, L.,Du, J.,Xu, P.,Jeney, G.,Yin, G.. 2013. The protective effect of silymarin on the carbon tetrachloride (CCl4)-induced liver injury in common carp (Cyprinus carpio). In Vitro Cellular and Developmental Biology 49:155-161
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3481018

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
Metric 17:	Outcome Assessment Methodology	High	× 2	2	
Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
Metric 21:	Statistical Methods	High	× 1	1	
Metric 22:	Reporting of Data	High	× 2	2	
Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.3	
Extracted		Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Y. Liu, L. Cao, J. Du, R. Jia, J. Wang, P. Xu, G. Yin. 2015. Protective effects of Lycium barbarum polysaccharides against carbon tetrachloride-induced hepatotoxicity in precision-cut liver slices in vitro and in vivo in common carp (Cyprinus carpio L.). Comparative Biochemistry and Physiology - Part C: Toxicology and Pharmacology 169:65-72
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3481539

Domain	Metric		Rating[†]	MWF[⋆]	Score	Comments[††]
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	Grade/Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Acclimation not reported
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	Number of organisms and replicates not reported
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Y. Liu, L. Cao, J. Du, R. Jia, J. Wang, P. Xu, G. Yin. 2015. Protective effects of Lycium barbarum polysaccharides against carbon tetrachloride-induced hepatotoxicity in precision-cut liver slices in vitro and in vivo in common carp (Cyprinus carpio L.). Comparative Biochemistry and Physiology - Part C: Toxicology and Pharmacology 169:65-72
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3481539

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Chen, C. Y.,Wooster, G. A.,Bowser, P. R.. 2004. Comparative blood chemistry and histopathology of tilapia infected with Vibrio vulnificus or Streptococcus iniae or exposed to carbon tetrachloride, gentamicin, or copper sulfate. Aquaculture 239:421-443
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3568343

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Manufacturer identified, but not certified by manufacturfer
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity/grade not identified
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	Medium	× 1	2	Did not specify if the controls were also injected
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Only 1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Number of organisms reported, but not replicates
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Chen, C. Y.,Wooster, G. A.,Bowser, P. R.. 2004. Comparative blood chemistry and histopathology of tilapia infected with Vibrio vulnificus or Streptococcus iniae or exposed to carbon tetrachloride, gentamicin, or copper sulfate. Aquaculture 239:421-443
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Hero ID:	3568343

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.4	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Birge, W. J.,Black, J. A.,Kuehne, R. A.. 1980. Effects of Organic Compounds on Amphibian Reproduction.
Data Type:	Acute (0-96 hour); Aquatic; other Amphibians
Hero ID:	3616521

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	Medium	× 1	2	Data were not shown beyond stating that the control survival ranged from 82 to 98 percent.
	Metric 6:	Randomized Allocation	Low	× 1	3	Randomized allocation was not reported, which is a deficiency.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Acclimatization and pretreatment conditions were not reported.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Number of replicates were reported, but not number of organisms per replicate.

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Study Citation: Birge, W. J.,Black, J. A.,Kuehne, R. A.. 1980. Effects of Organic Compounds on Amphibian Reproduction.
Data Type: Acute (0-96 hour); Aquatic; other Amphibians
Hero ID: 3616521

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	All organisms were purchased from suppliers and control mortality was acceptable. As a result, this is not a major flaw.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Medium	× 2	4	P/chem and statistics such as LC50 were reported, but not all the unmodified data necessary to re-create the statistics.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.3	
Extracted			Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21
Data Type:	Other; Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source of CCl4 was not reported, but it was noted that analytical grade CCl4 was used.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	Low	× 2	6	The study refers to a blank but doesn't say what's in the blank for CCl4. Figure 1 notes that the blank concentration for nitrobenzene is 0 mg/L. Notes regeneration rate determined on Day 7 as most D. japonica in the blank test could normally regenerate.
	Metric 5:	Negative Control Response	Low	× 1	3	Study reports that "In the blank tests, the average abnormal regeneration rate was 10 percent and no dead D. japonica were observed through the tests", but does not discuss CCl4 specifically
	Metric 6:	Randomized Allocation	Low	× 1	3	It's not reported whether animals were randomly allocated.
Domain 3: Exposure Characterization						

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Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21
Data Type:	Other; Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 7:	Experimental System/Test Media Preparation	Low	× 2	6	It's unclear whether the experiement was conducted in a closed or open system using static or flow through methods. The study reports, "The breeding liquid for Dugesia japonica was prepared by dissolving 3.74 g of NaCl, 0.49 g of KCl, and 8.5 5 g of CaC12 into distilled water to make 500 ml. This was diluted 100 times and neutralized by NaHC03 before use. Dugesiajaponica were collected from a stream around which there was no source of pollution and left without food for over 7 days in the breeding liquid to excrete alimentary canal contents. Those of about _2 cm long were used. Dugesia japonica was cut into two parts (head and body part) at the nearest section to the eyes of the trisected part between pharynx and eyes. The body part was used for the head regeneration test. Ten body parts were put in 100 ml ofa test solution, and this was left at 20 " 1"C for 7 days. Observation for head regeneration was carried out with a stereomicroscope on Days 3, 4, 5, 6, and 7 after head cutting, and the test solution was replaced at every observatiort. The degree of regeneration was classified as normal, eye spot, tetratophthalmic, anophthalmic, aciphthalmic, and death. The total number of eye spot, tetratophthalmic, anophthalmic, aciphthalmic, and death was regarded as the abnormal regeneration number. The ratio of the number to 10 on Day 7 was defined as the abnormal regeneration rate. The concentration of the chemical, at which the abnormal regeneration rate reached 50 percent, was defined as EC50" LC50 of D. japonica was determined at the same time. LC50 and EC50 values of the test mentioned above were determined on semilogarithmic paper."
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	Exposure methods were not reported for each study group
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	it was not reported whether nominal or measured conc were used. CCl4 is volatile, and study does not report whether test container was closed or open

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Data Type:	Other; Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 10:	Exposure Duration and Frequency	Medium	× 1	2	Exposure occurred over 7 days, and observation was carried out on days 3, 4, 5, 6, and 7 after head cutting, and the test solution was replaced at every observation.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Not reported for CCl4, but for nitrobenzene reports 4 exposure groups used plus control.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Minor uncertainties about the quality of the test organisms given they were collected from the field and no acclimation is mentioned. Study reports, "Dugesia japonica were collected from a stream around which there was no source of pollution and left without food for over 7 days in the breeding liquid to excrete alimentary canal contents. Those of about 2 cm long were used."
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Did not report whether they were acclimatized and they were collected from the field. Organisms were left without food for 7 days in the breeding liquid to excrete alimentary canal contents before exposure.
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	The study says "Dugesia japonica was cut into two parts (headand body part) at the nearest section to the eyes of the trisected part between pharynx and eyes. The body part was used for the head regeneration test.Ten body parts were put in 100 ml of a test solution, and this was left at 20 " 1"C for 7 days." n = 10 body parts per test concentration. Number of replicates not reported.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	Body parts were put in 100 ml of a test solution and this was left 20 " 1"C for 7 days.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	

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Data Type:	Other; Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 18:	Consistency of Outcome Assessment	Medium	× 1	2	Observation for head regeneration was carried out with a stereomicroscope on Days 3, 4, 5, 6, and 7 after head cutting, and the test solution was replaced at every observation. Outcomes for CCl4 not specifically reported.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	Medium	× 2	4	Confounding variables are discussed for planarian in terms of comparability of results with results from other species. the study says that confounding may occur due to the cutting of the head (stress of cutting of the head).
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	Data on health and attrition were not reported for each study group.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	Methods for calculating LC50 not described clearly
	Metric 22:	Reporting of Data	Low	× 2	6	Data for exposure related findings not reported for each study group for CCl4
	Metric 23:	Explanation of Unexpected Outcomes	Medium	× 1	2	They did report unexpected outcomes and explained relatively sufficiently. e.g. the planarian LC50 numbers being very different than the other two species.
Overall Quality Determination‡			Low		2.4	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source of CCl4 was not reported, but it was noted that analytical grade CCl4 was used.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	Unacceptable	× 2	8	The study does not mention a control anywhere. The study refers to a blank for Dugesia japonica (planarian) but doesn't say what's in the blank, and doesn't mention a blank for M. macrocopa (water flea)
	Metric 5:	Negative Control Response	N/A		N/A	No control reported
	Metric 6:	Randomized Allocation	Low	× 1	3	Study does not report whether animals were randomly allocated.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Low	× 2	6	It is not reported whether the container was closed or open, and CCL4 is a volatile chemical.
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	Exposure methods were not reported for each study group
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	It was not reported whether nominal or measured conc were used.
	Metric 10:	Exposure Duration and Frequency	Low	× 1	3	Exposure occurred over 3 hours, and OECD recommends 48 hours for invertebrate acute tests.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Unacceptable	× 1	4	Number of exposure groups and spacing of exposure levels not reported
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						

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Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	Low	× 2	6	Test species is a saltwater invertebrate, and were used at 5 days old, but the source of the species is not reported.
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	Study did not report acclimating water fleas.
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	10 organisms per exposure group. For freshwater invertebrates, OECD recommends at least 20. Number of replicates not reported.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	"Ten M. macrocopa in 100 ml of test solution were put in a 250-ml vial vessel at 20 " 1"C and the survivors were counted after 3 hr in order to determine LC50."
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	Low	× 1	3	Details of outcome assessment were not reported.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	Unacceptable	× 2	8	The study did not provide enough information to allow a comparison of environmental conditions or other non treatment related factors across study groups.
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	Data on health and attrition were not reported for each study group.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	Medium	× 1	2	Methods used to calculate LC50 were not described
	Metric 22:	Reporting of Data	Low	× 2	6	Data for exposure related findings were not reported for each study group
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			Unacceptable		4	
Extracted			No			

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Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3617749

Domain	Metric	Rating†	MWF⋆	Score	Comments††

⋆⋆ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, three of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

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Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3617749

Domain	Metric		Rating†	MWF*	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source of CCl4 was not reported, but it was noted that analytical grade CCl4 was used.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Analytical grade CCl4 was used.
Domain 2: Test Design						
	Metric 4:	Negative Controls	Unacceptable	× 2	8	The study does not mention a control anywhere. The study refers to a blank for Dugesia japonica (planarian), and Figure 1 indicates the blank for nitrobenzene is a concentration of 0 mg/L. Study doesn't mention a blank for the O. latipes (red killifish) LC50 test..
	Metric 5:	Negative Control Response	N/A		N/A	No control reported
	Metric 6:	Randomized Allocation	Low	× 1	3	Study does not report how test organisms were allocated
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Low	× 2	6	LC50 test methods do not describe measures taken to minimize loss of test substance and concentrations of test substance not reported as being measured during study. For the oxygen uptake test, test was completed in a closed container (sealed with an electrode), but there were uncertainties about how much air space there was in the flask.
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	Exposure methods were not reported for each study group
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	It was not reported whether nominal or measured conc were used.
	Metric 10:	Exposure Duration and Frequency	Low	× 1	3	Exposure occurred over 48 hours, and it sounds like a static test but it is not clear. OECD recommends 96 hours for fish acute tests.

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Data Type: Acute (0-96 hour); Aquatic; Fish
Hero ID: 3617749

Domain	Metric		Rating†	MWF*	Score	Comments††
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	For CCl4, it is unclear how many exposure groups were used for the LC50 determination. (For the oxygen uptake it looks like 5 exposure groups according to figure 2 but that was a different test.)
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Minor uncertainties about the quality of the test organisms given they were collected from the market. Study reports, "Orizias latipes (ca. 3 cm, 0. 3 g) was obtained from the market and acclimated for at least 1 week in dechlorinated water at 20"C (total hardness was about 80 mg/liter).
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	× 1	2	Fish were acclimatized for at least 1 week and OECD recommends 12 days before they are used for testing.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	10 organisms per exposure group. OECD recommends at least 7. Number of replicates was not reported
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	10 fish in 2 liters of water which is a little more than what OECD would recommend. At 0.3 g each and 10 fish per container, it should be a 3 liter flask.
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	Low	× 1	3	Details of outcome assessment were not reported.
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	Low	× 2	6	Study did not provide enough information to allow a comparison of environmental conditions or other non-treatment-related factors across study groups, and the omitted information is likely to have a substantial impact on study results.
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	Data on health and attrition were not reported for each study group.

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Study Citation:	Yoshioka, Y.,Ose, Y.,Sato, T.. 1986. Correlation of the Five Test Methods to Assess Chemical Toxicity and Relation to Physical Properties. 12:15-21
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3617749

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	Low	× 1	3	Methods used to calculate LC50 were not described
	Metric 22: Reporting of Data	Low	× 2	6	Data for exposure related findings not reported for each study group
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		Unacceptable		4	
Extracted		No			

⋆⋆ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Tsai, K. P.,Chen, C. Y.. 2007. An Algal Toxicity Database of Organic Toxicants Derived by a Closed-System Technique. Environmental Toxicology and Chemistry 26:1931-1939
Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	3617867

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Source was not provided
	Metric 3:	Test Substance Purity	Medium	× 1	2	Purity was not provided. Authors described the chemical purity as "reagent grade"
Domain 2: Test Design						
	Metric 4:	Negative Controls	Medium	× 2	4	Authors referred to a control when discussing how they calculated their EC50 value, but additional details were not reported. The authors indicated that the details of the test setup can be found at the following source: Lin JH, Kao WC, Tsai KP, Chen CY. 2005. A novel algal toxicity testing technique for assessing the toxicity of both metallic and organic toxicants. Water Res 39:1869"1877.
	Metric 5:	Negative Control Response	Low	× 1	3	Negative Control response was not specifically reported in the study, but was incorporated into the calculation of the percent inhibition.
	Metric 6:	Randomized Allocation	Low	× 1	3	Researchers did not report how organisms were allocated to study groups
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 2	4	Test concentrations were reported in terms of nominal concentrations, but analytical confirmation of the test concentrations was performed at the beginning and end of the test by HPLC. This was intended to quantify any potential degradation.
	Metric 10:	Exposure Duration and Frequency	Medium	× 1	2	The test was 48 hours, but should be 72/96 hrs in duration.

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Study Citation:	Tsai, K. P.,Chen, C. Y.. 2007. An Algal Toxicity Database of Organic Toxicants Derived by a Closed-System Technique. Environmental Toxicology and Chemistry 26:1931-1939
Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	3617867

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	The study report indicated that both a range finding and definitive test were conducted but did not report the test concentrations.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Data on attrition was not reported for each study group, but is unlikely to have a substantial impact on results.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Medium	× 2	4	Quantitative results were not provided.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

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Study Citation:	Tsai, K. P.,Chen, C. Y.. 2007. An Algal Toxicity Database of Organic Toxicants Derived by a Closed-System Technique. Environmental Toxicology and Chemistry 26:1931-1939
Data Type:	Acute (0-96 hour); Aquatic; Plants
Hero ID:	3617867

Domain	Metric	Rating†	MWF⋆	Score	Comments††

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation: Schell, J. D. J.. 1987. Interactions of Halogenated Hydrocarbon Mixtures in the Embryo of the Japanese Medaka (Oryzias latipes).
Data Type: Other; Aquatic; Fish
Hero ID: 3625489

Domain		Metric	Rating†	MWF*	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Study did not report whether allocation to study groups was random.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Nominal concentrations were used. An experiment was conducted to evaluate rate of loss of CCl4 from the exposure vials. After 24 hours, the solution CCl4 concentration was 46 percent of the initial nominal concentration
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	10 embryos per dose group, but no mention of how many replicates.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation: Schell, J. D. J.. 1987. Interactions of Halogenated Hydrocarbon Mixtures in the Embryo of the Japanese Medaka (Oryzias latipes).
Data Type: Other; Aquatic; Fish
Hero ID: 3625489

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Data on attrition was reported in each exposure group. Other health outcomes were not reported. Adults were periodically treated with a chemical regime to prevent disease. Eggs were not collected from females of a breeding group that had been chemically treated for disease until at least one week following the treatment.
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	Medium	× 2	4	Most but not all outcomes were reported; only minor uncertainties.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.4	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3634436

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported; does state that procedures in ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates, and amphibians. E729-80, were followed
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Report states "all test chambers were open to the atmosphere" but water samples were collected for analysis at 0, 48 and 96 hours., and at 24 or 72 hours in odd- or even-numbered tanks.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	Test substance concentrations measured throughout test
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	Acute Exposure duration of 96 hours
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	All tests consisted of five toxicant treatments with a dilution factor of 0.5
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	exposure concentrations relative to solubility limit not reported
Domain 4: Test Organism						

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Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3634436

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	High	× 2	2	Fathead m1nnows (30_:!::5 day old) were obtained from the University of Wisconsin-Superior and U.S. EPA Environmental Research laboratory, Duluth, MN culture units.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	Recommended procedures for care, handling and acclimation of test organisms were followed (ASTM 1980).
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	The number of organisms in each test chamber was ten for fathead minnows
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	Environmental conditions (temperature, DO, pH, hardness ,measured and reported. Biomass loading requirements were met as stated by ASTM (1980)
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	The criteria for death was lack of reaction to gentle prodding. Exposureswere checked every 24 hr for death and behavioral effects.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	Outcome after 96 hour exposure reported
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	Environmental conditions similar among study groups
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	LC50's and EC50's with their respective 95 percent confidence limits were calculatedby the trimmed Spearman-Karber method (Hamilton et al. 1977).
	Metric 22:	Reporting of Data	High	× 2	2	Data were reported for each treatment and control group
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	No unexpected outcomes with CCl4
Overall Quality Determination‡			High		1.2	

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Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3634436

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Extracted		Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3634436

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	All acute toxicity tests were conducted with duplicate controls
	Metric 5:	Negative Control Response	High	× 1	1	None of the tests had more than 10 percent of the control organisms that died or appeared stressed
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported; does state that procedures in ASTM. 1980. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates, and amphibians. E729-80, were followed
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Report states "all test chambers were open to the atmosphere" but water samples were collected for analysis at 0, 48 and 96 hours., and at 24 or 72 hours in odd- or even-numbered tanks.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	Test substance concentrations measured throughout test
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	Acute Exposure duration of 96 hours
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	All tests consisted of five toxicant treatments with a dilution factor of 0.5
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	exposure concentrations relative to solubility limit not reported
Domain 4: Test Organism						

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Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3634436

Domain	Metric		Rating†	MWF⋆	Score	Comments††
	Metric 13:	Test Organism Characteristics	Medium	× 2	4	Adult amphipods were collected from the Eau Claire River. Douglas County, WI.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	Recommended procedures for care, handling and acclimation of test organisms were followed (ASTM 1980).
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	The number of organisms in each test chamber was five or ten for amphipods. Number used in the CCl4 test not specified
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	Environmental conditions (temperature, DO, pH, hardness ,measured and reported. Biomass loading requirements were met as stated by ASTM (1980)
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	The criteria for death was lack of reaction to gentle prodding. Exposureswere checked every 24 hr for death and behavioral effects.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	Outcome after 96 hour exposure reported
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	Environmental conditions similar among study groups
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	LC50's and EC50's with their respective 95 percent confidence limits were calculatedby the trimmed Spearman-Karber method (Hamilton et al. 1977).
	Metric 22:	Reporting of Data	High	× 2	2	Data were reported for each treatment and control group
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	No unexpected outcomes with CCl4
Overall Quality Determination‡			High		1.3	

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Study Citation:	Brooke, L.. 1987. Report of the Flow-Through and Static Acute Test Comparisons with Fathead Minnows and Acute Tests with an Amphipod and a Cladoceran.
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3634436

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Extracted		Yes			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Geiger, D. L.,Brooke, L. T.,Call, D. J.. 1990. Acute toxicities of organic chemicals to fathead minnows (Pimephales promelas): Volume V.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3660853

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Geiger, D. L.,Brooke, L. T.,Call, D. J.. 1990. Acute toxicities of organic chemicals to fathead minnows (Pimephales promelas): Volume V.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3660853

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.0	
Extracted		Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Weber, L. J.,Gingerich, W. H.,Pfeifer, K. F.. 1979. Alterations in Rainbow Trout Liver Function and Body Fluids Following Treatment with Carbon Tetrachloride or Monochlorobenzene. 99:401-413
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3662132

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Medium	× 1	2	Only source listed, no other details
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity/Grade not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Injection dosing described but test chambers and set-up not described
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Not measured
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	1 study only has 1 concentration
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Weber, L. J.,Gingerich, W. H.,Pfeifer, K. F.. 1979. Alterations in Rainbow Trout Liver Function and Body Fluids Following Treatment with Carbon Tetrachloride or Monochlorobenzene. 99:401-413
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3662132

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.4	
Extracted			Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Richie, J. P., Jr.,Mills, B. J.,Lang, C. A.. 1984. The Verification of a Mammalian Toxicant Classification Using a Mosquito Screening Method. 4:1029-1035
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3673049

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	High	× 1	1	
	Metric 3:	Test Substance Purity	Low	× 1	3	The info was not provided
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation method not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Exposure concentrations were not reported, though their determination was described
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Solubility of some of the test chemicals and solvents used were described, but not pertaining to CCl4
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Richie, J. P., Jr.,Mills, B. J.,Lang, C. A.. 1984. The Verification of a Mammalian Toxicant Classification Using a Mosquito Screening Method. 4:1029-1035
Data Type:	Acute (0-96 hour); Aquatic; Invertebrates
Hero ID:	3673049

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
Metric 17:	Outcome Assessment Methodology	High	× 2	2	
Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
Metric 21:	Statistical Methods	High	× 1	1	
Metric 22:	Reporting of Data	High	× 2	2	
Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.3	
Extracted		Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i \left(\text{Metric Score}_i \times \text{MWF}_i\right) / \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Koskinen, H.,Pehkonen, P.,Vehniainen, E.,Krasnov, A.,Rexroad, C.,Afanasyev, S.,Molsa, H.,Oikari, A.. 2004. Response of Rainbow Trout Transcriptome to Model Chemical Contaminants. 320:745-753
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3684136

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	The info was not provided
	Metric 3:	Test Substance Purity	Low	× 1	3	The info was not provided
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not described
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Medium	× 2	4	Test system described but not in great detail
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	Only nominal concentrations were reported
	Metric 10:	Exposure Duration and Frequency	Medium	× 1	2	Justification for exposure duration and frequency not provided
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Details about exposure groups and concentration levels not provided
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	Solvents were discussed, but not for CCl4
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Koskinen, H.,Pehkonen, P.,Vehniainen, E.,Krasnov, A.,Rexroad, C.,Afanasyev, S.,Molsa, H.,Oikari, A.. 2004. Response of Rainbow Trout Transcriptome to Model Chemical Contaminants. 320:745-753
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3684136

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment						
	Metric 17:	Outcome Assessment Methodology	High	× 2	2	
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	× 1	1	
	Metric 22:	Reporting of Data	High	× 2	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡			High		1.5	
Extracted			Yes			

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3684293

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/Information not reported
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.
Data Type:	Acute (0-96 hour); Aquatic; Fish
Hero ID:	3684293

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.1	
Extracted		Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	3684293

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Source/information not reported
	Metric 3:	Test Substance Purity	High	× 1	1	
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	High	× 2	2	
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Kimball, G.. 1978. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna.
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	3684293

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.1	
Extracted		Yes			

⋆ MWF = Metric Weighting Factor
† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.
†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.

Study Citation:	Kotsanis, N.,Metcalfe, C. D.. 1988. Accelerating an in vivo trout carcinogenesis assay with carbon tetrachloride and partial hepatectomy. 15th Annual Aquatic Toxicity Workshop
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	4338225

Domain	Metric		Rating†	MWF⋆	Score	Comments††
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	
	Metric 2:	Test Substance Source	Low	× 1	3	Not reported
	Metric 3:	Test Substance Purity	Low	× 1	3	Not reported
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	
	Metric 5:	Negative Control Response	High	× 1	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	× 2	6	nominal injection
	Metric 10:	Exposure Duration and Frequency	High	× 1	1	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	There was only a single injection dose.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	This was not discussed.
Domain 4: Test Organism						
	Metric 13:	Test Organism Characteristics	High	× 2	2	
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	

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Study Citation:	Kotsanis, N.,Metcalfe, C. D.. 1988. Accelerating an in vivo trout carcinogenesis assay with carbon tetrachloride and partial hepatectomy. 15th Annual Aquatic Toxicity Workshop
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	4338225

Domain	Metric	Rating†	MWF⋆	Score	Comments††
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	High	× 2	2	
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination‡		High		1.4	
Extracted		Yes			

⋆ MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

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$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) \,/\, \sum_j \text{MWF}_j \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Metrics that are rated 'High' met the criteria for high confidence as expected for this type of study, and may not require additional comments.